REMARKS/ARGUMENTS

Claims 1-10 were pending. Claim 9 has been amended herein. Claim 10 has been cancelled without intending to abandon or to dedicate to the public any patentable subject matter. Accordingly, following entry of the foregoing amendments, Claims 1-9 will be pending.

Objection to the Drawings

The Examiner has objected to Figure 7 as not showing Coil 8 as indicated in the specification at page 40, line 11. Applicants have amended the specification to clarify that the coil 8 is shown in Figure 6 and does not appear in Figure 7. In light of this clarification, Applicants submit that Figure 7 complies with 37 CFR 1.84(p)(5), and no new amended replacement drawing sheet is necessary.

Objection to the Specification

The Examiner has objected to certain typographical and grammatical errors appearing in the specification at pages 6, 24, 34 and 42. Applicants have amended the specification as suggested by the Examiner to remove these errors. Furthermore, Applicants have amended additional grammatical errors appearing the specification. Applicants submit that no new matter has been introduced into the specification by the correction of these grammatical errors.

Claim Rejections Under 35 U.S.C. § 103

The Examiner has rejected Claims 9 and 10 under 35 U.S.C. § 103(a) as being obvious over JP 09115851A ("Mizuno") in view of U.S. Patent No. 4,951,009 ("Collins").

Applicants have cancelled Claim 10.

Regarding Claim 9, applicants have amended this claim to recite the requirement that the two variable impedance elements have no mechanically moving section and are arranged in parallel with one of the elements being earthed and the other connected to the plasma generating apparatus via a condenser. Support for this limitation can be found in the specification at least

at: Figures 6 and 7;

page 13, lines 13-14;
page 17, lines 5-10 and lines 16-18;
page 40, lines 21-26;
page 43, lines 5-10; and,
page 46, lines 1-3.

These limitations indicate that the plasma doping apparatus of Claim 9 preforms stable low-density doping and very reproducible plasma doping. Also, by gradually changing one of the control parameters to gradually changed the impedance during the plasma generation, reproducibility is further improved.

Additionally, Applicants have amended Claim 9 to require that a gradual impedance change is accomplished by changing one or more control parameters while maintaining the plasma generation. Support for this limitation can be found in the specification at least at:

page 45, line 2 through page 46, line 9;
page 15, lines 10-14; and,
page 46, line 22 through page 47, line 4.

In contrast (as described at page 7, lines 6 – 19) a typical matching circuit of the prior art includes two variable capacitors (or stubs in the case of a microwave) functioning as variable impedance elements. The two variable capacitors having a mechanical section which is driven by a motor. Thus, an impedance matching adjustment typically takes one second or longer because of the mechanical rotation by the motor. The reflected power degrades the reproducibility of the processing. Further, the reflected power is liable to generate a noise resulting in erroneous operation of the apparatus. Even worse, the rotation (movement) of the verbal capacitors (stubs) may overrun the appropriate position, causing extinction of the plasma.

Collins relates to the connection of a first electrical circuit to a second electrical circuit using a matching network. Mizuno relates to a method of introducing impurities composed of atomic elements and electrons into the surface of a solid sample such as a semiconductor substrate in a lower temperature region, a device therefor, and a method of manufacturing a semiconductor device using this method of introducing impurities.

Initially, it should be noted that Collins and Mizuno reside in very distinct technical fields as indicated by their subject matter as well as their International Patent Classification. Applicants submit that it is unlikely that the technical innovations of Collins and Mizuno would be combined by the skilled artisan without reference to the present invention.

Mizuno fails to teach or suggest that the two variable impedance elements have no mechanically moving section or their arrangement or the ability to gradually change the impedance.

Although Collins teaches that the matching circuit is composed of two toroidal cores (as shown in Figures 8 and 10 and described at column 10, lines 10 – 27), Collins fails to teach or suggest that the two variable impedance elements are arranged in parallel while one of the variable impedance elements is earthed and the other of the variable impedance elements is connected to the plasma generating apparatus via a condenser. Additionally, Collins fails to teach that a gradual impedance change may be accomplished by gradually changing a control parameter such as the gas species, the gas flow rate, the pressure, or the high frequency electric power while maintaining the plasma generation, as required by Claim 9, as amended. Thus, using the device and method of Collins, it is very difficult to perform stable low-density doping with reproducible results or to make gradual impedance changes to further improve the reproducibility. Thus, the combination of Mizuno and Collins does not teach or suggest all of the limitations of Claim 9, as amended. In light of these amendments and the shortcomings of the cited references, Applicants believe that the Examiner's rejection under 35 USC § 103(a) should be withdrawn.

Based upon the foregoing, Applicants believe that all pending claims are in condition for allowance and such disposition is respectfully requested. In the event that a telephone conversation would further prosecution and/or expedite allowance, the Examiner is invited to contact the undersigned.

Respectfully submitted,
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